

DISCOVERY OF *ORYZA RUFIPOGON* (POACEAE:
ORYZEA), NEW TO THE UNITED STATES,
WITH ITS IMPLICATIONS¹

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ABSTRACT

A population of Wild Red Rice (*Oryza rufipogon* Griff.) was discovered in the Everglades National Park in south Florida. It has been growing in the area since at least 1959. This is the first occurrence of this species in the United States. Previous reports of its occurrence in the United States were evaluated as incorrect.

RESUMEN

Una poblacion de arroz rojo silvestre (*Oryza rufipogon* Griff.) fue descubierto en el Parque Nacional Everglades en el sur de Florida. Ha estado creciendo en el area desde por los menos 1959. Es la primera ocurrencia de esta especie en los Estados Unidos. Registros previos de su ocurrencia en los Estados Unidos fueron evaluados como incorrectos.

A number of exotic plants have been introduced and naturalized in Florida, with many becoming major weed problems (Gifford 1937, MacKenzie and Hall 1967, Vandiver 1980). From a botanical perspective one needs to be aware of plants extending their range because of possible negative economic impacts. In addition it is important to use correct taxonomic nomenclature when monitoring new plant introductions which have the potential to become weedy. Unless

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proper identification of a particular plant of interest is obtained, no accurate assessment of an increase in a plant's range is possible.

The genus *Oryza* has 22 species, including 20 wild and two cultivated species (Chang 1988, Tateoka 1963). The genus occurs in Australia, Burma, Central America, Sri Lanka, China, India, Indonesia, Malaysia, the Philippines, South America, and Thailand (Oka 1988b).

Oryza sativa L., cultivated rice of Asian origin (Oka 1988b), ranks with wheat in importance as a world food source (Chang 1985). The cultivated rice of African origin, *O. glaberrima* Steud., occurs primarily in West Africa, in the savanna on the southern region of the Sahara desert (Oka 1988b). Rice cultivation began in many parts of south and southeast Asia, perhaps first in India (Chang 1976), and weeds undoubtedly developed along with rice. Because of the importance of this crop, weeds which affect the quality and quantity of yields are critical in world food production.

Some major rice weeds are from the rice complex. Red Rice, *O. sativa* L. var. *fatua* Prain, is a widespread weed in cultivated rice, including production areas in the United States.

Wild Red Rice, *O. rufipogon*, is often found in non-taxonomic literature in the United States. *Oryza rufipogon* has apparently been erroneously applied to Red Rice in that literature, and thus has created confusion (Webster 1990).

The perennial *O. rufipogon* has not been reported previously in the United States. It occurs in Australia, Burma, Central America, China, India, Indonesia, Malaya, Philippines, South America, and Thailand. The grains are used as a famine food in some regions of the world, though of lower quality than cultivated rice.

A population of *O. rufipogon*, Wild Red Rice, documented first in July 1959, has been identified in Florida. It is growing in Taylor Slough near the Royal Palm Visitor Center, Everglades National Park, Homestead, Dade County, Florida, covering approximately 0.6 ha.

The *O. rufipogon* found in Florida is a perennial with a stout rhizome and fibrous roots. *Oryza sativa* var. *fatua* is an annual with a fibrous root system. The rhizome is a reliable means of identification for *O. rufipogon*.

The newly discovered *O. rufipogon*, a rhizomatous perennial, has erect to trailing culms which can reach 4.0 m in length. Leaf sheaths are smooth to somewhat scabrous distally. The membranous ligule is often lobed and up to 4.3 cm long. Auricles, 1.0 mm wide at the base, 0.3 mm wide at the tip, and 8.0 mm in length, are usually present (Duistermaat 1987). Leaf blades are up to 2.5 cm wide and 78 cm long. Inflorescences are up to 33 cm long. Spikelets are 8.0 to 9.6 mm long and have awns 3.0 to 5.0 cm long. The individual seeds on an inflorescence ripen at different times and fall over a period of several weeks. In South Florida flowering can begin in late October and continue into February.

Oka (1988a) described *O. rufipogon*, from which *O. sativa* is thought to have

originated, as exhibiting a perennial-annual continuum. However, Barbier (1989b) reported that in Thailand *O. rufipogon* is separated into two populations: (a) an annual population reproducing exclusively by seeds, and (b) a perennial population reproducing almost completely by asexual means. Barbier (1989a) also reported that the perennial population grows in low-lying areas that remain moist in the dry season, producing a small number of seeds and reproducing mainly by rhizomes. In contrast, the annual form grows in habitats that are parched during the dry season. The annual forms produce many seeds during a brief period, after which the plants become senescent.

A competitive weed in rice fields, *O. rufipogon* has the undesirable characteristic of hybridizing with *O. sativa*, cultivated rice (Reed 1977, Wirjahardja and Susilo 1979). With its competitive growth and inferior grain quality, *O. rufipogon* can lower the quality and the yield of domestic rice.

Plants with the potential to be particularly weedy in the United States have been designated as Federal Noxious Weeds by the United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA, APHIS). This is in an effort to limit both the movement into and the spread within the country of these designated species.

In September 1987 Randy G. Westbrook wrote to the Flora of North America (FNA) Newsletter requesting assistance in soliciting the help of botanists to determine past or present localities of Federal Noxious Weeds. In January 1988 the FNA Newsletter published this letter and a complete list of Federal Noxious Weeds. Collections in the University of Florida Vascular Plant Herbarium contain 16 Federal Noxious Weeds from Florida.

One species of concern was *O. rufipogon*, collected on 27 November 1985, the only record of *O. rufipogon* in the continental United States. The collection site is 100 km from the commercial rice producing region of Florida in the Everglades Agricultural Area. *O. rufipogon* represents a threat to the Everglades National Park, highly valued as both an International Biosphere Reserve and as a United Nations World Heritage Site. Voucher specimens are deposited at the Vascular Plant Herbarium of the University of Florida in Gainesville.

Additional surveys of Taylor Slough found *O. rufipogon* scattered over an area of approximately 0.6 ha. The largest contiguous stand of the weed, approximately 0.02 ha, was growing in a muck pond 40 m north of the Anhinga Trail. Scattered plants were found growing around the pond and in the adjacent surrounding marsh including elongated plants growing in the partial shade of a mixed stand of Coastal Plain Willow, *Salix caroliniana* Michx. and Common Reed, *Phragmites australis* (Cav.) Trin. ex Steud.

Earlier misidentifications of the *O. rufipogon* at this location were due to the similarity of closely related species in this complex of cultivated rice. All of the specimens of Wild Red Rice collected before 27 November 1985 consisted of only the top of the fruiting plant. The inflorescence of *O. rufipogon* is very similar

to *O. sativa*. Having no reason to suspect *O. rufipogon* being in the United States, flowering and fruiting characteristics of these specimens were likely overlooked.

The earliest known recorded specimen is in the Everglades Herbarium, Beard Center, Everglades National Park. This specimen was collected on 11 July 1959 in the Taylor Slough by William G. Atwater and determined by Erdman West as *O. sativa*. It was annotated as *O. sativa* in 1979 by George N. Avery and as *O. rufipogon* by David Hall in 1989.

Additional specimens include: FLORIDA: Broward Co.: cultivated at the Research and Education Center of the University of Florida, Fort Lauderdale, from material obtained at the entrance to the Anhinga Trail, Royal Palm Hammock, Everglades National Park, 20 Nov 1989, *Hall 1911* (FLAS). Dade Co.: growing in water 3.2 cm deep, Taylor Slough, Everglades National Park, 16 Nov 1961, *F.C. Craighead s.n.* (EVERGLADES NATIONAL PARK HERBARIUM, FLAS); growing in shallow water at the edges of the pond at the entrance to Anhinga Trail, Royal Palm Hammock, Everglades National Park, 27 Nov 1985, *Herndon 1356* (FLAS); shoreline of pond, entrance to Anhinga Trail, Royal Palm Hammock, Everglades National Park, 19 Sep 1988, *Vandiver s.n.* (FLAS); entrance to Anhinga Trail, Royal Palm Hammock, Everglades National Park, near Homestead, 13 Mar 1990, *Hall 1920* (FLAS); 38.5 m W of wooden boardwalk, entrance to Anhinga Trail, Royal Palm Hammock, Everglades National Park, 24 Apr 1990, *Vandiver s.n.* (FLAS); 27.5 m E of bridge, entrance to Anhinga Trail, Royal Palm Hammock, Everglades National Park, 24 Apr 1990, *Vandiver s.n.* (FLAS).

The origin of this introduction is unknown; however, Victor B. Morris a park volunteer in the Everglades National Park, reported that the plant was growing in the area much earlier than 1959. He said that he observed the plant growing in the same area in the mid-1930s (Morris 1990). This area of the Everglades National Park was part of Royal Palm State Park dedicated on 23 November 1916. Morris indicated that numerous introduced species were planted in the Royal Palm State Park during the 1920s in the immediate vicinity of the current Royal Palm Visitor Center.

If *O. rufipogon* has been growing in Taylor Slough since the mid-1930s as the above report indicates, or even since July 1959, it has been slow to extend its range in the area. The limited spread of the infestation is likely due to growth from rhizomes rather than from dispersed seeds. Considering growth habit and area colonized, this particular population of *O. rufipogon* seemingly lies on the perennial side of the perennial-annual continuum described by Oka (1988a). Additional environmental factors such as plant competition could also have had an effect on the growth of the plant, limiting the spread of the infestation. Other weeds introduced into new habitats show slow initial growth for many years followed by an explosive growth stage. Control efforts for *O. rufipogon* have been initiated in Taylor Slough.

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